Extensive cardinal parameter model to predict growth of pseudomonads in salt-reduced lightly preserved seafood

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ABSTRACT

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Title:	Extensive cardinal parameter model to predict growth of pseudomonads in salt-reduced lightly preserved seafood
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Topic:	PREDICTIVE MODELS FOR FOOD SAFETY AND QUALITY: DECONTAMINATION, FOOD FORMULATION,... ETC
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Introduction and Objectives:	Interest in and demand for preserved seafood with reduced salt/sodium content is increasing. As a consequence of the reduced salt content potential growth of psychrotolerant pseudomonads to unacceptable high concentration where they cause product spoilage is an increasing challenge. Innovation is needed to reformulate these salt-reduced products and this must be done in such a way that other product characteristics compensate for less inhibiting effect due to salt. Numerous simple predictive models are available to predict growth of pseudomonads in foods at different temperatures. A few models include the effect of temperatures and salt. However, these simple secondary models do not include the effect of a broader range of product characteristics and therefore they cannot be used to predict how the inhibiting effect of salt can be replaced by changes in other environmental factors The objective was to develop an extensive predictive model that allows growth of psychrotolerant pseudomonads to be predicted in brined and marinated seafood with a range of different organic acids
Materials and Methods:	The new model was developed by expanding an existing cardinal parameter-type model for growth of pseudomonads in dairy products and including terms for temperature, pH, aw/NaCl, lactic- and sorbic acids (Martinez-Rios et al., Int. J. Food Microbiol. 216. 110-120, 2016). MIC-values for acetic-, benzoic- and citric acids were determined in broth and terms modelling their antimicrobial effect were added to the model. The new and expanded model included eight environmental factors and their interactive effects. The new model was evaluated under constant and dynamic temperature conditions using challenge tests and storage trials with a total of 78 growth curves in well characterized seafoods including lumpfish roe and brined shrimps
Result:	Average bias and accuracy factor values were 1.07 and 1.20 for 69 growth curves at constant temperatures. For nine growth curves at dynamic temperatures 77 % of the growth data (log cfu/g) was within the acceptable simulation zone of +/- 0.5 log cfu/g. The new model can be used to facilitate product reformulation as shown here for brined shrimps at 8°C, pH of 5.8 and water phase organic acid concentrations of 3000 ppm (citric), 1200 ppm (benzoic) and 500 ppm (sorbic). When the water phase salt concentration in this product is reduced from 3% to 1% growth of psychrotolerant pseudomonads change from none in 42 days to > 7 log cfu/g increase in 8 days. However, by including 500 ppm of acetic acid the reformulated prevent growth of psychrotolerant pseudomonads
Conclusion:	The high number of environmental factors included in the new model makes it flexible and suitable to support product development as the effect of substituting one combination of preservatives with another can be predicted